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MILKING FREQUENCY AND HERD NUTRITION IMPROVE PRODUCTION

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Progressive dairy farmers aim to increase herd milk yield while improving production efficiency. However, zero payments for over-quota production, surplus skim milk powder on the domestic market and poor cull cow prices have created a precarious situation. More than ever, producers must carefully manage production to avoid shipping over-quota milk.

Genetics can play a huge role in milk production management, but only as a long-term strategy. Over a short period, milking frequency and nutrition play the largest role in milk yield and composition from an individual cow.

To lower production temporarily by reduced milking frequency, the animal's energy status at dry off must be considered, during transition and throughout lactation. This also requires careful monitoring to avoid serious udder health consequences and long-term production losses. As well, there may be additional veterinary expenses associated with prolonged milking intervals.

If increasing production by milking more often is the goal, it is necessary to calculate the energy balance in a cow's diet accordingly. Labour and feed costs will ultimately determine whether it makes a difference to the bottom line. Studies report the economic consequences of increased labour costs and feed due to more frequent milking are minimized where:

- labour costs are already low (e.g., using family labour)
- the current milking routine produces a large yield per cow
- large yields are gained with the increased milking frequency

Increasing milking frequency for your entire herd or a select group of cows will raise milk yields but will also produce lower fat and protein levels in milk. Research has demonstrated that twice-a-day (2X) milking gives you a higher fat percentage compared to three times a day (3X). Increasing milking to 3X, however, produces a greater fat yield than 2X (see Table 1, below).

TABLE 1.
Milk Yield and Component Responses to Twice Daily (2X) Versus Three Times Daily (3X) Milking Frequency for Primiparous and Multiparous Cows

Parity	Milking Frequency	Milk Yield (kg/day)	Fat %	Fat Yield (g/day)
Primiparous	2X	18.7	3.69	769
	3X	22.0	3.62	859
Multiparous (more than one calf)	2X	19.1	3.65	894
	3X	22.6	3.48	987
Difference (3X–2X)		3.5	–0.17	93

Erdman et al., 1995

Increased milking frequency was also found to improve udder health status, with lower somatic cell counts (SCCs) observed for 3X compared to 2X. Researchers have also noted that this improvement was reversed when cows were switched back to 2X — bulk tank SCCs gradually rose to previous levels.

In a recent study for predicting milk production levels, factors that influence milk production during lactation — milking frequency and nutrition — were applied to a mathematical formula. It calculated mammary cell growth between milkings and during the lactation to see how milk yield would be affected. Using data from past studies, researchers predicted yields from milking frequency increases and decreases that used different nutritional strategies.

Production differences compared to 2X milking were –6.2 kg/day for 1X, +3.5 kg/day for 3X and +4.9 kg/day for 4X. Using the mathematical formula, the researchers calculated 1X milking could result in a production loss of 29%–33% compared to 2X milking during the previous lactation. Production would increase 8%–10% for 3X, and 12%–16% for 4X.

Results from these calculations indicate the potential to increase or decrease milk yield through milking frequency and the major role nutrition plays. The figures don't reflect actual outcomes. Effects will vary greatly between individual cows. One reason is the number of actively secreting mammary cells in each cow's udder, which can be influenced by genetically selected traits, diet, environment and body condition.

While the number of actively secreting cells in the mammary gland dictate milk production, the rate of milk secretion from the udder also affects yield. A cow's energy status greatly influences this secretion rate.

To test the mathematical formula, the researchers created two different diet groups to predict nutritional effects on milking frequency. Measuring the amount of dry matter intake, they fed one group a low pasture allowance, and another a high pasture allowance, with pasture quality the same. Yield was calculated for both groups for 1X, 2X, 3X and 4X milking frequencies to demonstrate the effect nutrition would have on milk production.

As expected, the high pasture allowance produced a greater yield by providing most of the cows' energy demand to meet the increased metabolism needed for milk production. Yield also increased for each group as milking frequency increased. This proved that increased milking frequency requires more energy, so the cow can keep up with milk secretion occurring in the udder between milkings to provide maximum yield. Increased feed and labour costs associated with more frequent milking paid off with increased production over the entire lactation period.

Reduced milking frequencies significantly slow down the milk secreted by the mammary cells as the udder fills to capacity during longer milking intervals. The cow requires less energy for milk production. This results in less feed and lower labour costs, but reduces the cow's yield over the entire lactation.

Researchers also looked at the effects on milk production of temporarily switching milking frequencies during lactation. They found that timing was critical when switching frequencies, and observed the best results in early lactation. Two separate studies looked at changing the milking frequency during the first 21 days of lactation and then resuming the normal frequency for the rest of the lactation.

Studies of the milking frequency changes that stretch beyond the first 3 weeks of lactation have shown little to no benefit in yield over the rest of the lactation period when compared to changes made only in the first 21 days. The first 3 weeks of lactation have the greatest impact on milk yield, whether slowing down or increasing production.

In the first study, data were collected from cows milked 1X for the first 3 weeks of lactation and then switched back to 2X milking until the end of lactation. Production initially dropped 21% during the first 3 weeks, with a 9% drop occurring over the rest of the lactation. Using the formula to account for nutrition and energy level differences, the scientists predicted an 8%–21% production drop during the first 3 weeks, and a 4% drop thereafter.

The second study, conducted recently in Maryland, concluded that increasing the milking frequency to 4X from 2X milking during the first 21 days could cause a persistent milk yield increase throughout the entire lactation. The yield, at 37.8 kg/day, was higher over the entire lactation following this milking frequency change when compared to 34.5 kg/day when 2X milking was used from the beginning of lactation. A persistent yield increase to 37.6 kg/day was observed even when the milking frequency was delayed by 4 days after calving.

The production drop from decreased milking frequency in the first 3 weeks can be attributed to the reduction in milk secreted from the udder's mammary cells. This is due to the udder filling to capacity before the next milking, signalling the cells to stop secreting milk. The production drop during the rest of the lactation is due to an increased loss of actively secreting mammary cells in the udder from lower prolactin levels.

Prolactin is a hormone released during milking that encourages the growth of actively secreting mammary cells. When milking frequency increases, these actively secreting cells increase in number due to more of this hormone being released at each milking in early lactation. This provides the persistent yield increase observed over the lactation period.

These studies all have the same theme: Nutrition and milking frequency must both be considered to manage milk production.

Increasing or decreasing milking frequency doesn't have to apply to the whole herd at once. A producer can focus on increasing production from first-time fresheners, or have a group genetically selected for large udder cistern capacities that can hold off milking for extended periods. Whatever the production goals, consider changing milking frequency during the first 21 days of lactation for the greatest impact on production.

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